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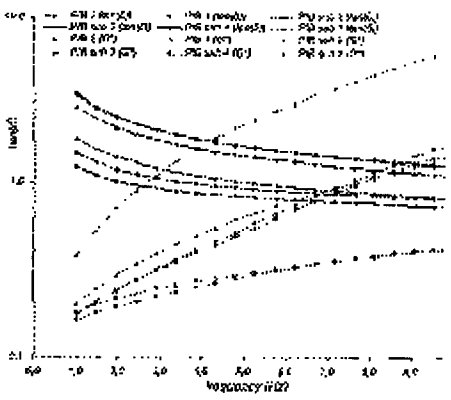
最終頁

(54)【発明の名称】チューインガムベース用分解性エラストマー

(57)【要約】
チューインガム配合物に一般的に適用可能である低分子量エラストマー置換化合物を含む新規の分解性ガムベースが提供される。特に、２つまたはそれ以上の異なる環状エステルモノマーの重合により得ることができるポリエステルポリマーを含むガムベースおよびチューインガムが提供されるが、この場合、環状エステルモノマーのガラス転移温度（Ｔｇ）は低く、またポリエステルポリマーのガラス転移温度（Ｔｇ）は－２０℃乃至－８０℃の範囲である。



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TECHNICAL FIELD

[Field of the Invention]
[0001]
This invention relates to the field of chewing gum. The new resolvability gum base which generally contains an applicable low-molecular-weight elastomer substituted compound in a chewing gum compound especially is provided. Although especially this invention provides the gum base and chewing gum containing the polyester polymer which can be obtained by the polymerization of a different cyclic ester monomer beyond two or it, In this case, the glass transition temperature (Tg) of that cyclic ester monomer is low, and the ranges of the glass transition temperature (Tg) of polyester polymer are -20 ** thru/or -80 **.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[0116]
[Drawing 1]G^* and the tan(d) opposite pitch about a synthetic polyisobutylene substitute (PIBsub.1, PIBsub.2, PIBsub.3, and PIBsub.4) including two standards, PIB1 and PIB2, are shown.
[Drawing 2]G' pair vibratory torque (muN.m) about the gum base shown in Table 4 and two additional conventional gum bases is shown.
[Drawing 3]The tan(d) opposite vibratory torque (muN.m) about the gum base shown in Table 4 and two additional conventional gum bases is shown.
[Drawing 4]G' pair vibratory torque (muN.m) about synthetic polyisobutylene substitutes and those mixtures is shown.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Field of the Invention]
[0001]
This invention relates to the field of chewing gum. The new resolvability gum base which generally contains an applicable low-molecular-weight elastomer substituted compound in a chewing gum compound especially is provided. Although especially this invention provides the gum base and chewing gum containing the polyester polymer which can be obtained by the polymerization of a different cyclic ester monomer beyond two or it, In this case, the glass transition temperature (Tg) of that cyclic ester monomer is low, and the ranges of the glass transition temperature (Tg) of polyester polymer are -20 ** thru/or -80 **.
[Background of the Invention]
[0002]
or [that the gum to which the chewing gum dropped into indoor or outdoor environment was dropped exists a road the foot-walk surface, and in environment] -- or in order to stick to the human shoes and clothes which are moving firmly, if it produces [a remarkable trouble and inconvenient], generally it will be recognized. The fact of generally being based on use of the natural origin which is nondegradable substantially or a composite elastomer, and resin polymer by available chewing gum products in environment is substantially added to such [trouble and inconvenient].
[0003]
Therefore, in order that city administration which takes indoor and the clean responsibility for outdoor environment may remove the dropped chewing gum, remarkable efforts must be paid, but such efforts require cost and are not accompanied by a satisfying result.
[0004]
The trial which reduces the trouble accompanying extensive use of chewing gum has been made improving the cleaning method which validates them more about removal of the wreckage of the dropped chewing gum, by blending an anti-binder into a chewing gum compound, etc. However, there was nothing that contributed to solution of this environmental pollution problem intentionally among these preventive measures.
[0005]
In the past 20 years, synthetic polyester has come to attract attention increasingly to various uses which range from a biomedical device to a gum base. Many of these polymer is resolvability, it hydrolyzes into those monomer hydroxy acid easily, and these are easily removed by the metabolic fate. It is expected that resolvability (called biodegradability) polymer is a conventional nondegradable plastic or substitutes of a low degradable plastic, such as polystyrene, polyisobutylene, and polymethyl-methacrylate, for example.
[0006]
Therefore, the thing for which chewing gum may be made from the synthetic polymer of a certain kind which has an unstable combination chemically the bottom of the influence of light or in those polymer

chains that may be disassembled into water solubility and an avirulent constituent in hydrolysis, It was indicated by recent years, for example, U.S. Pat. No. 5,672,367. The chewing gum by which the application for patent was carried out contains at least one resolvability polyester polymer obtained, for example by the polymerization of cyclic ester on the basis of lactide, glycolide, trimethylene carbonate, and epsilon-caprolactone. I hear that it can decompose in environment and there is chewing gum made from such polymer by which reference is made with biodegradability although indicated to the patent concerned.

[0007]

The resolvability chewing gum which contains in U.S. Pat. No. 6,153,231 the polylactic acid copolymer chosen from a poly (lactic acid-dimer-fatty acid-oxazoline) copolymer and a poly (lactic acid-diol-urethane) copolymer is indicated.

[0008]

Generally, a chewing gum composition contains an insoluble in water nature flavor agent in water solubility most (bulk portion), an insoluble in water nature gum base portion, and a type target typically.

[0009]

One or the elastomer compound beyond it which an insoluble in water nature gum base is generally a thing of composition or natural origin, and is obtained, The ingredient of a little others, such as one or the resin compound beyond it, one or an elastomer plasticizer beyond it, a bulking agent, a softening compound, an antioxidant, and colorant, is included.

[0010]

An elastomer provides with rubber Mr. adhesiveness the gum base which changes with the methods by which the chemical structure of this constituent and it are blended with other ingredients. Typically, the elastomer compound in a gum base is nondegradable. As such an elastomer, a synthetic elastomer, for example, polyisobutylene, Isobutylene-isoprene copolymer (butyl elastomer), a styrene butadiene copolymer, polyisoprene, polyethylene, polyvinyl acetate, vinyl acetate BINIRURAURETO copolymers, and those combination are mentioned. However, the natural elastomer is also applied into chewing gum now. As such a natural elastomer, crude rubber, such as smoke-dried latex or fluid latex, and GUAYURUGOMU, For example, DIERA (jelutong), RECHIKASUPI (lechi caspi), PERIRO (perillo), Masa Rendu BABARATA (massaranduba balata), A MASARANDEYUBACHOKO rate (massaranduba chocolate), NISUPERO (nispero), rosin JINHA (rosidinha), Chicle (chicle), the gutta-percha (gutta percha), Natural gum, such as gutta KATAIU (gutta kataiu), niger gutta (niger gutta), TSUNU (tunu), chilte (chilte), CHIKIBURU (chiquibul), and the gutta hang kang (gutta hang kang), is mentioned.

[Description of the Invention]

[Problem(s) to be Solved by the Invention]

[0011]

Although it can replace all over a chewing gum base by resolvability polymer containing the polyester polymer which can obtain an elastomer compound, for example, polyisobutylene etc., by the polymerization of a different cyclic ester monomer beyond two or it, In this case, it was clarified by this invention persons here that the glass transition temperature (Tg) of a cyclic ester monomer is low, and the ranges of the glass transition temperature (Tg) of polyester polymer are -20 ** thru/or -80 **. In this way, the chewing gum base which uses such resolvability polymer for a surprising thing, and is prepared, For example, having the rheology characteristic (for example, plasticity (storage modulus) and elasticity (loss modulus)) the same as that of the conventional gum base prepared using polyisobutylene (PIB) or similar was found out.

[0012]

Typically, an elastomer compound improves dramatically the general resolvability of a gum base (i.e., the chewing gum itself) by constituting 20 thru/or 60% of all the gum base constituents, and replacing this constituent with the gum base which has a resolvability constituent.

[Means for Solving the Problem]

[0013]
Therefore, a mode of this invention is a gum base which consists of polyester polymer obtained by the polymerization of a different cyclic ester monomer beyond two or it, Glass transition temperature (Tg) of a cyclic ester monomer is low, and it is related with a gum base which is a range whose glass transition temperature (Tg) of polyester polymer is -20 ** thru/or -80 **.
[0014]
Further mode of this invention is related with chewing gum which consists of a chewing gum base which the above of this specification defined below again.
[0015]
According to the further embodiment of this invention, chewing gum or a gum base may contain a partial substitution functional group (here elastomer), but a substitution functional group is biodegradability in this case.
[0016]
According to the further embodiment of this invention, it was shown clearly that the conventional non-biodegradable functional group itself might be replaced by other biodegradable polymer suitable in rheology.
[Best Mode of Carrying Out the Invention]
[0017]
The manufacture strategy of the elastomer for gum bases has a low glass transition temperature, and, on the whole, is amorphous, or is producing polymer which is a crystalline substance slightly (it has a crystalline substance melting temperature lower than a room temperature).
[0018]
The desirable method for obtaining such polymer is using combining two or the low Tg monomer beyond it, as a different repeating unit blocks crystallization.
[0019]
Therefore, one mode of this invention is a gum base which consists of polyester polymer which can be obtained by the polymerization of a different cyclic ester monomer beyond two or it, The glass transition temperature (Tg) of a cyclic ester monomer is low, and it is related with the gum base which is a range whose glass transition temperature (Tg) of polyester polymer is -20 ** thru/or -80 **.
[0020]
Preferably, a cyclic ester monomer is chosen from the group which consists of 4 member lactone, 5 member lactone, 6 member lactone, 7 member lactone, 8 member lactone, five-membered ring-like carbonate, and 6 membered-ring-like carbonate.
[0021]
Lactone is chosen from the group which consists of beta propiolactone, gamma-butyrolactone, delta-valerolactone, an epsilon-caprolactone, and 7-heptanolactone preferably, and cyclic carbonate is ethylene carbonate or trimethylene carbonate preferably.
[0022]
A desirable embodiment is a gum base which consists of polyester polymer which can be obtained by the polymerization of a different cyclic ester monomer beyond two or it, A cyclic ester monomer is related with the gum base chosen from the group which consists of epsilon-caprolactone, a delta-valerolactone, and trimethylene carbonate.
[0023]
A cyclic ester monomer epsilon-caprolactone is a desirable monomer, and polyester polymer contains at least 50-mol% of epsilon-caprolactone preferably.
[0024]
The ranges of the glass transition temperature (Tg) of polyester polymer are -25 ** thru/or -75 ** preferably, and the ranges of the glass transition temperature (Tg) of polyester polymer are -45 ** thru/or -75 ** more preferably.
[0025]
The desirable embodiment about the gum base which consists of a gum base which consists of poly

(epsilon-caprolactone -**- delta-valerolactone), and poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is indicated below. Various embodiments of the following gum bases also relate to the above-mentioned gum base.

[0026]

Whether the main purposes of this invention are carelessly dropped by consumers Or when discarded, It compares with the chewing gum used as the chewing gum products more easily disassembled in environment, and/or the chewing gum containing conventional nondegradable polymer after digestion, It is providing the gum base for the chewing gum which may be mechanically removed more easily by use of/or a detergent.

[0027]

Therefore, the chewing gum base provided in this specification, physical in chewing gum, when applied into chewing gum -- it being made chemically and/or biological more easy to decompose, and thereby, For example, the thrown-away chewing gum waste is a gum base which consists of a fall place removable easily, or collapses eventually to the lump or particles which cannot be recognized any longer as wreckage of chewing gum. the copolymer of chemical factors, such as hydrolysis to which the decomposition or collapse of a gum base provided by this detailed letter may be caused by change of physical agents, such as temperature, light, and humidity, and pH, or this invention -- **** ---izing -- it performs by operation of a **** suitable enzyme, or may be derived.

[0028]

Therefore, a glance target of this invention is providing the gum base containing the terpolymer which consists of the resolvability copolymer which consists of an epsilon-caprolactone and a delta-valerolactone and epsilon-caprolactone, a delta-valerolactone, and trimethylene carbonate.

[0029]

As mentioned above, it became clear by applying such a copolymer or a terpolymer the synthetic elastomer compound typically applied into chewing gum compositions, such as polyisobutylene (PIB), and that a nondegradable elastomer compound could be replaced thoroughly substantially. So that also unexpectedly clearly from the following examples the rheology profile of polyisobutylene, By making it harmonize with the rheology profile of epsilon-caprolactone, delta-valerolactone, trimethylene carbonate, the resolvability copolymer of those mixtures, or a terpolymer, Do this substitution, without spoiling the rheology characteristic of the chewing gum made from a gum base and such a gum base. Therefore, the conventional gum base prepared using PIB and the similar rheology characteristic (for example, plasticity (loss modulus) and elasticity (storage modulus)) can be obtained. Plasticity and elasticity are essential parameters to the cloth in the last chewing gum.

[0030]

It is thought that it is advantageous to apply as an elastomer substitute to other elastomer compounds other than polyisobutylene as for the above-mentioned new resolvability polymer, and it obtains it. Therefore, polymer, such as poly (epsilon-caprolactone -**- delta-valerolactone) and poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate), Isobutylene-isoprene copolymer (butyl elastomer), a styrene butadiene copolymer, It is also within the limits of this invention that it may be applied as elastomer compounds, such as polyisoprene, polyethylene, polyvinyl acetate, and a vinyl acetate BINIRURAURETO copolymer, and a substitute to those combination.

[0031]

Therefore, a glance target of this invention is providing the chewing gum base which consists of a poly (epsilon-caprolactone -**- delta-valerolactone) copolymer.

[0032]

Preparation of a poly (epsilon-caprolactone -**- delta-valerolactone) copolymer may be carried out by the technical field concerned by suitable various polymerization methods (for example, ring opening polymerization (ROP) under existence of a suitable catalyst) which are known. Therefore, since the mixture of the monomer of epsilon-caprolactone and delta-valerolactone is polymerized in one embodiment, And in order to obtain poly (epsilon-caprolactone -**- delta-valerolactone), tin octoate (SO) is applied as a catalyst and low-molecular-weight alcohol (for example, propylene glycol) may be

beneficially applied as an initiator. However, it is also meant that this polymerization may be carried by applying various aluminum alkoxide compounds as an initiator.

[0033]

It is understood that the mol percentage of the monomer in polymer of this invention may be adjusted by applying different polymerization conditions in order to obtain the rheology characteristic of a request of the gum base meant so that polymer may be applied, respectively. Therefore, it is thought that each monomer of wide range mol percentage may be applied beneficially.

[0034]

Therefore, in a useful embodiment, a poly (epsilon-caprolactone -**- delta-valerolactone) copolymer may be compounded so that it may have each monomer of specific mol percentage. Therefore, in one embodiment of this invention, the mol percentage of epsilon-caprolactone in poly (epsilon-caprolactone -**- delta-valerolactone) is 1 thru/or 99-mol% of the range. The mol percentage of each monomer of synthetic polymer may be measured by ^{13}C-NMR analysis, for example.

[0035]

In the further embodiment, the mol percentage of epsilon-caprolactone in poly (epsilon-caprolactone -**- delta-valerolactone) is 40 thru/or 80-mol% of the range, for example, 50 thru/or 70-mol% of the range, for example, 55 thru/or 65-mol% of the range. In one embodiment, the mol percentage of epsilon-caprolactone in poly (epsilon-caprolactone -**- delta-valerolactone) is about 60-mol %.

[0036]

Similarly, although the chewing gum base of this invention may contain ** poly (epsilon-caprolactone -**- delta-valerolactone) advantageously, In this case, it is understood that the mol percentage of delta-valerolactone is 1 thru/or 99-mol% of the range, for example, 20 thru/or 60-mol% of the range, for example, 30 thru/or 50-mol% of the range. In one embodiment, the mol percentage of delta-valerolactone is about 40-mol %.

[0037]

As mentioned above, a suitable gum base is meant as the poly (epsilon-caprolactone -**- delta-valerolactone) from which structural characteristics, such as a molecular weight (for example, a number average molecular weight (Mn) and weight average molecular weight (M_w)), differ may be included. Therefore, in one embodiment the chewing gum base of this invention, The range of 10,000 thru/or 125,000g/mol, for example, the range of 20,000 thru/or 100,000g/mol, For example, the poly (epsilon-caprolactone -**- delta-valerolactone) which has a number average molecular weight (Mn) of the range of 30,000 thru/or 90,000g/mol, for example, the range of 40,000 thru/or 80,000g/mol, is included.

[0038]

The important rheology feature about the gum base applied into a chewing gum composition is glass transition temperature (Tg). When using in this specification, glass transition temperature means temperature with a ratio of storage-modulus G' (elasticity) and loss-modulus G" (plasticity) equal to 1. Storage-modulus G' and loss-modulus G" of polymer may be measured by applying a flow meter like AR1000 made from AT Instrument generally.

[0039]

According to one embodiment, the gum base of this invention contains the poly (epsilon-caprolactone -**- delta-valerolactone) copolymer which has the glass transition temperature (Tg) which is less than 0 **. In a useful embodiment, it is a range which are the range whose poly (epsilon-caprolactone -**- delta-valerolactone) glass transition temperature is -40 ** thru/or -80 **, for example, -50 **, and -70 **.

[0040]

Crystallinity may be controlled by incorporating a branched chain or introducing **-** Nomar. As biodegradable comonomer which can be considered, delta-valerolactone (VAL), 6 membered-ring-like ester and trimethylene carbonate (TMC), and 6 membered-ring-like carbonate are mentioned.

[0041]

As mentioned above, the further purpose of this invention is to provide the chewing gum base which

consists of poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate). Therefore, resolvability comonomer trimethylene carbonate is contained in polymer of this invention in the further mode.

[0042]

Preparation of a poly(epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) terpolymer may be carried out, for example by the technical field concerned by the above-mentioned various polymerization methods which are known.

[0043]

According to this invention, the mol percentage of epsilon-caprolactone in poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate), In a useful embodiment, it may be 1 thru/or 99-mol% of the range, for example, 20 thru/or 80-mol% of the range, for example, 40 thru/or 60-mol% of the range. In the desirable embodiment of this invention, the mol percentage of epsilon-caprolactone in poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is about 50-mol %.

[0044]

Furthermore, according to this invention, a gum base 1 thru/or 99-mol% of the range, for example, 20 thru/or 60-mol% of range, For example, the poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) which has delta-valerolactone of the mol percentage of 30 thru/or 50-mol% of the range may be included. In one specific embodiment, the mol percentage of delta-valerolactone in poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is about 40-mol %.

[0045]

The mol percentage of trimethylene carbonate in poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) may be 1 thru/or 50-mol% of the range, for example, 2 thru/or 30-mol% of the range, for example, 5 thru/or 15-mol% of the range, in a useful embodiment. In a useful embodiment, the mol percentage of trimethylene carbonate in poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is about 10-mol %.

[0046]

As mentioned above, structural characteristics, such as a molecular weight, may be doubled about each specific gum base. Therefore, in one embodiment, a chewing gum base contains the poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) which has a mean number molecular weight (Mn) of the range of 10,000 thru/or 150,000g/mol. In a useful embodiment, a poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) molecular weight (Mn), It is the range of 20,000 thru/or 100,000g/mol, for example, the range of 30,000 thru/or 90,000g/mol, for example, the range of 40,000 thru/or 80,000g/mol.

[0047]

According to the further useful embodiment, the gum base of this invention contains the poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) which has the glass transition temperature Tg below 0 **. However, it is also within the limits of this invention that the ranges of the poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) glass transition temperature Tg are the range of -40 ** thru/or -80 **, for example, -50 **, and -70 **.

[0048]

. As mentioned above, this invention contains a poly (epsilon-caprolactone -**- delta-valerolactone) copolymer. Or the chewing gum which consists of a chewing gum base containing a poly(epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) terpolymer is also provided. However, in a specific embodiment, it is understood that merging all over a gum base is advantageous as for this copolymer and terpolymer, and it obtains them in order to attain the specific rheology feature or characteristic. Therefore, the chewing gum products on the basis of the gum base of this invention indicated in this specification are provided.

[0049]

When using in this specification, the expression a "gum base" points out the insoluble in water nature portion of the chewing gum which constitutes 10 thru/or 99% of the weight of the total chewing gum compound (preferably 10 thru/or 50 % of the weight) typically generally. Typically, a chewing gum

base compound contains the ingredient of a little others, such as one or the resin compound beyond it of one which is a thing of composition or natural origin and is obtained or the elastomer compound beyond it, nature, or the synthetic origin, a bulking agent, a softening compound and an antioxidant, and colorant.

[0050]

Therefore, besides resolvability elastomer copolymer poly (caprolactone -**- delta-valerolactone) and terpolymer poly (caprolactone -**- delta-valerolactone courtly methylene carbonate), [portion / gum base] It is natural origin or a composite thing, and it is within the limits of this invention to contain the nondegradable polymers elastomer and/or resin of a certain rate to obtain. The rate of such nondegradable polymer may be 1 thru/or 99% of the weight of a range, for example, 5 thru/or 90% of the weight of the range, for example, 10 thru/or 50% of the weight of the range.

[0051]

In relation to this, as a useful synthetic elastomer, . Were enumerated into Food and Drug Administration CFR, the title 21, and the section 172,615 (the Masticatory Substances, Synthetic). For example, the polyisobutylene which has a gas pressure chromatography (GPC) average molecular weight of about 10,000 thru/or about 1,000,000 range, for example, the range of 50,000 thru/or 80,000, The styrene butadiene copolymer which has a styrene butadiene ratio of isobutylene-isoprene copolymer (butyl elastomer), for example, about 1:3, thru/or about 3:1, Polyisoprene, polyethylene, polyvinyl acetate, for example, about 5, or about 50 % of the weight, For example, although the vinyl acetate BINIRURAURETO copolymer which has a copolymer of 10 thru/or 45% of the weight of a vinyl laurate content, and the synthetic elastomer of those combination are mentioned, it is not limited to these.

[0052]

For example, it is common to combine the synthetic elastomer which has the amount of polymers and a low-molecular-weight elastomer all over a gum base at the technical field concerned. As desirable combination of the now of a synthetic elastomer, Polyisobutylene and styrene butadiene, polyisobutylene, and polyisoprene, Polyisobutylene and isobutylene-isoprene copolymer (isobutylene isoprene rubber), And the combination of polyisobutylene, a styrene butadiene copolymer, and isobutylene-isoprene copolymer, And although polyvinyl acetate, each of vinyl acetate BINIRURAURETO copolymers, and each above-mentioned synthetic polymer of all in admixture with those mixtures are mentioned, it is not limited to these.

[0053]

As a useful natural nondegradable elastomer, as "Masticarory Substances of Natural Vegetable Origin", Food and Drug Administration, The elastomer enumerated into CFR, the title 21, and the section 172,615, For example, crude rubber compounds, such as crude rubber of smoking or fluid latex, GUAYURUGOMU, and others, For example, DIERA (jelutong), RECHIKASUPI (lechi caspi), MASARANDEYUBABARATA (massaranduba balata), Sorva (sorva), PERIRO (perillo), rosin JINHA (rosindinha), A MASARANDEYUBACHOKO rate (massaranduba chocolate), chicle (chicle), NISUPERO (nispero), the gutta hang kang (gutta hang kang), and those combination are mentioned. A desirable synthetic elastomer and natural elastomer concentration change the chewing gum in which a base is used by whether it is adhesiveness or is the conventional thing, it is a bubble gum, or it is ordinary gum so that it may be considered below. As a desirable natural elastomer at present, DIERA, a chicle, Massa Rendu BABARATA, and sorva are mentioned.

[0054]

However, in a useful embodiment, the gum base of this invention which consists of poly (epsilon-caprolactone -**- delta-valerolactone) and/or poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) further, It is also meant that the elastomer or resin polymer compound which is resolvability environmentally or biologically may be included advantageously.

[0055]

In the relation of this invention, the term of an environmental or biological resolvability polymer compound, . It is made casting-away backward [of chewing gum] physical and to decompose

chemically and/or biologically. The chewing gum waste thrown away by that cause comes to be more easily removed from a casting-away place, or collapses to a lump or particles eventually, and this points out the chewing gum base constituent it becomes impossible to already recognize as wreckage of chewing gum. chemical factors, such as hydrolysis to which such decomposition or collapse of resolvability polymer is caused by change of physical agents, such as temperature, light, and humidity, or pH, or polymer -- **** ---izing -- it performs by operation of a **** enzyme, or may be derived. in other useful embodiments -- the polymer component of a gum base -- all -- environmental -- **** ---izing -- **** -- or -- biological -- **** ---izing -- it is **** polymer.

[0056]

Therefore, as an additional environmental or suitable example of biodegradation possible chewing gum base polymer which may be applied according to the gum base of this invention, Protein including the derivative like for example, resolvability polyester, polycarbonate, polyester amide, polypeptide and the homopolymer of amino acid, for example, polylysine, and a proteolysis thing, for example, zein hydrolyzate, is mentioned. As this kind of an especially useful compound, the polyester polymer obtained, for example by the polymerization of cyclic ester beyond one or it, such as lactide, glycolide, trimethylene carbonate, delta-valerolactone, beta propiolactone, and epsilon-caprolactone, is mentioned. Such resolvability polymer may be a homopolymer or copolymers, such as block polymer, for example.

[0057]

According to this invention, a useful chewing gum base constituent may include one or the resin compound beyond it which contributes to obtaining the desired digestion characteristic, and acts as a plasticizer for the elastomers of a gum base constituent. In the context of this invention, as a useful elastomer plasticizer, A synthetic resin like the polyvinyl acetate (PVAc) which has a GPC average molecular weight of 2,000 thru/or about 90,000 range, for example, the range of 3,000 thru/or 80,000, And glycerol ester of partial hydrogenation rosin, glycerol ester of polymerization-ized rosin, The glycerol ester of partial dimerization rosin, the glycerol ester of the Tal oil rosin, Natural resins, such as natural rosin ester often called Estergom, such as pentaerythritol ester of partial hydrogenation rosin, methyl ester of rosin, partial hydrogenation methyl ester of rosin, and pentaerythritol ester of rosin, are mentioned. A synthetic resin like the terpene resin obtained from a synthetic resin, for example, alpha pinene, beta pinene, and/or d-limonene as other useful resin compounds, natural terpene resin, and the arbitrary suitable combination of the above-mentioned thing are mentioned. A desirable elastomer plasticizer changes also according to a specific use and the kind of elastomer (singular number or plurality) used.

[0058]

A chewing gum base compound by request, for example Magnesium carbonate and calcium, Silicate compounds, such as sodium sulfate, soil limestone, for example, a magnesium silicate, and aluminum, One, or the bulking agent / textures processing agents beyond it (texturiser), such as cellulose polymer, such as kaolin and clay, an aluminum oxide, silicon oxide, talc, titanium oxide, the phosphoric acid 1 and 2, and tricalcium, for example, wood etc., and those combination may be included.

[0059]

A bulking agent / textures processing agent may also include natural organic fibers, such as fruit plant nature textiles, grain, and rice, cellulose, and those combination, for example.

[0060]

When using in this specification, the term of a "softener" means the ingredient which softens a gum base or a chewing gum compound, and includes wax, a fat, an oil, an emulsifier, a surface-active agent, and a solubilizing agent.

[0061]

According to this invention, a gum base compound, for example Tallow, hydrogenation tallow, Arbitrary completenesses or partial hydrogenation animal fat, full hydrogenation and partial hydrogenation vegetable oil, or a fat, Cocoa butter, degreasing cocoa butter, glycerol monostearate, One or the fats beyond it, such as glycerol triacetate, lecithin, mono-, di- and triglyceride, acetylation monoglyceride, and fatty acid (for example, stearic acid, pulmitic acid, oleic acid, and linolic acid),

and/or those combination may be included.
[0062]
Since a gum base is softened further, and in order to give it a water binding characteristic (these give a comfortable smooth surface to a gum base, and reduce the adhesiveness), A gum base is 0 thru/or 12% of the weight of quantity preferably 0 thru/or 18% of the weight typically, and one or the emulsifier beyond it is usually added by the constituent. Lactate and acetate ester of mono- ** JI of the mono- ****** diglyceride of edible fat acid, and edible fat acid, and triglyceride, Sucrose polyester of acetylation mono- ****** diglyceride and edible fat acid, or sugar ester (this description content), for example, WO00/25598 What is indicated by being used into this specification by reference, Na, K, Mg and Ca stearate, lecithin, hydroxylation lecithin, Glycerol monostearate, glycerol triacetate, fatty acid (for example, stearic acid, pulmitic acid, oleic acid, and linolic acid), propyl gallates, and those combination are the examples of the emulsifier used conventionally added by the chewing gum base. When [following] biological or a medicine manufacture active ingredient exists, in order to distribute and emit an active ingredient, a compound may contain a specific emulsifier of a certain kind and/or solubilizing agent.
[0063]
Wax is conventionally used for [for adjustment of consistency] softening of a chewing gum base, when preparing a chewing gum base. a suitable kind of wax used conventionally [arbitrary] in this invention, for example, ******, polyethylene **, ****** (refining paraffin and ********), paraffin, beeswax, carnauba wax, and Camps Delia -- wax may be used.
[0064]
A gum base compound may include colorant, such as a charge of FD&C printing and a rake, fruit and a plant extract, and a titanium dioxide, white colors, and those combination according to this invention, for example. As a still more useful chewing gum base constituent, antioxidants, such as butylated hydroxytoluene (BHT), burylhydroxyanisole (BHA), propyl gallate, and tocopherol, and an antiseptic may be included, for example.
[0065]
The presentation of the chewing gum base compound mixed with the following chewing gum additive agents may change substantially with digestion of a request [with a specific output prepared] of a final product in a row, and the other consciousness characteristics. However, the typical range of the above-mentioned gum base constituent (% of the weight), Get down with that of the following, come out and Certain :5 thru/or 100% of the weight (for example, 5 thru/or 50 % of the weight) of an elastomer compound, The ingredient of others, such as colorant, 5 thru/or 55% of the weight of an elastomer plasticizer, 0 thru/or 50% of the weight of a bulking agent / texture machining agent, 5 thru/or 35% of the weight of a softener, and 0 thru/or 1 % of the weight, for example, an antioxidant.
[0066]
A chewing gum center compound contains the portion of water solubility generally containing various chewing gum additive agents besides the above-mentioned insoluble in water nature gum base constituent. In the relation of this invention, in the conventional chewing gum manufacturing process, the term of a "chewing gum additive agent" means the arbitrary constituents added by the gum base, and is used. Although the main part of the additive agent used such conventionally is water solubility, an insoluble in water nature constituent, for example, an insoluble in water nature flavor compound, may be contained.
[0067]
In the relation of this invention, as a chewing gum additive agent, The constituent of others like a pharmacological or activity biologically substance which gives the desired characteristic to extensive sweetners and high intensity sweetners, a flavor agent, a softener, an emulsifier, colorant, a binding material, an acid taste agent, a bulking agent, an antioxidant, and completion chewing gum products is mentioned.
[0068]
As suitable extensive sweetners, both sugar and a nonsugar sweet taste constituent are mentioned. As for

extensive sweetners, about 5 thru/or 95 % of the weight of abbreviation of chewing gum constitutes about 20 of gum thru/or about 80 % of the weight, for example, 30 thru/or 60 % of the weight, still more typically typically.

[0069]

Generally known useful sugar sweetners by a chewing gum technical field For example, sucrose, Although sugars content constituents, such as glucose, malt sugar, dextrin, trehalose, D-tagatose, dry invert sugar, fructose, levulose, galactose, and a corn syrup solid, are independent or it is combination, it is not limited to these.

[0070]

Sorbitol may be used as nonsugar sweetners. Although sugar-alcohol of others, such as mannitol, xylitol, hydrogenation starch hydrolysate, maltitol, isomaltol, erythritol, and a RAKUCHI toll, is independent or combination is mentioned as other useful nonsugar sweetners, for example, it is not limited to these.

[0071]

A high intensity artificial sweetener is also independent, or may be used combining the above-mentioned sweetners. As a desirable high intensity sweetening agent, Scralose, Aspartame, the salt of Acesulfam, Although Ali Teemu, saccharin and its salt, cyclamic acid and its salt, glycyl lysine, dihydrochalcone, thaumatin, monellin, SUTERIOSHIDO, etc. are independent or combination is mentioned, it is not limited to these. In order to provide survivability sweet taste and flavor consciousness over a long period of time, it is desirable to enclose at least some artificial sweeteners, or to control the discharge, if that is not right. humid granulation and wax -- technique like granulation, spray drying, spray cooling, fluid bed coating, coacervation, yeast intracellular enclosure, and textiles extrusion molding may be used for attaining a desired emission characteristic. Enclosure of a sweetening agent may be provided even if it uses another chewing gum constituent like a resin compound.

[0072]

The level used of an artificial sweetener changes considerably and is decided by the effect of sweetners, a releasing speed, the degree of sweetness of a request of output, the level of a flavor agent used, a kind, and cost consideration. Therefore, the activity level of an artificial sweetener may change at about 0.02 thru/or about 8 % of the weight. When the carrier used for enclosure is contained, the level used of enclosure sweetners becomes high proportionally. The combination of sugar and/or nonsugar sweetners may be used into the chewing gum compound processed according to this invention. Additional sweet taste can be provided like [when a softener also uses sugar or alditol solution].

[0073]

When low-calorie-content gum is desirable, a low-calorie-content extender may be used. As an example of a low-calorie-content extender, polydextrose, a rough tee sirloin, Rough CHIRIN, fructooligosaccharide (Nutraflora (registered trademark)), paratinose oligosaccharide, guar rubber hydrolyzate (for example, Sun Fiber (registered trademark)), or indigestible nature dextrin (for example, Fibersol (registered trademark)) is mentioned. However, other low-calorie-content extenders may also be used.

[0074]

When pharmacological or a biological activity ingredient exists especially as further chewing gum additive agent that may be contained in the chewing gum of this invention, a surface-active agent and/or a solubilizing agent are mentioned. As an example of the kind of surface-active agent used as a solubilizing agent in the chewing gum composition of this invention, H.P. A list of Fiedler, Lexikon der Hilfstoffe fur Pharmacie, Kosmetik und AngrenzendeGebiete, page63-64 (1981), and the approval food emulsifier of each country is referred to. Negative ion nature, positive ion nature, both sexes, or a nonionic solubilizing agent may be used. As a suitable solubilizing agent, lecithin, polyoxyethylene stearate, Polyoxyethylene sorbitan fatty acid ester, fatty acid salt, the mono- ****** diacetyltartrate of the mono- ****** diglyceride of edible fat acid, The citrate of the mono- ****** diglyceride of edible fat acid, saccharose ester of fatty acid, Polyglycerol ester of fatty acid, polyglycerol ester of interchange esterification castor oil acid (E476), Sodium stearoyl RACHIRETO, sodium lauryl sulfate, And sorbitan

ester and polyoxy ethylation hydrogenation castor oil (for example, product currently sold with the trade name of CREMOPHR) of fatty acid, The block copolymer of ethylene oxide and propylene oxide (for example, product currently sold with the trade name of PLURONIC and POLOXAMER), Polyoxyethylene fatty alcohol ether, polyoxyethylene sorbitan fat ester, sorbitan ester of fatty acid, and polyoxyethylene stearate are mentioned.

[0075]

Especially a suitable solubilizing agent Polyoxyethylene stearate, for example, polyoxyethylene (8) stearate, and polyoxyethylene (40) stearate, polyoxyethylene sorbitan fatty acid ester (TWEEN (mono-laurate), for example, TWEEN20,.) TWEEN80 (monooleate), TWEEN40 (monopalmitate), . Are sold with the trade name of TWEEN60 (monostearate) or TWEEN65 (tristearate). The mono- ****** diacetyltartrate of the mono- ****** diglyceride of edible fat acid, The citrate of the mono- ****** diglyceride of edible fat acid, sodium stearoyl RACHIRETO, They are the block copolymer of sodium lauryl sulfate, polyoxy ethylation hydrogenation castor oil, ethylene oxide, and propylene oxide, and polyoxyethylene fatty alcohol ether. A solubilizing agent is a single compound or may be the combination of some compounds. Under existence of an active ingredient, a desirable carrier known with the technical field concerned may also contain chewing gum.

[0076]

The chewing gum of this invention may contain an aromatic, a flavor agent, for example, nature, and a resultant wind taste agent with the gestalt of a natural-plants constituent, oil refinement, essence, an extract, and powder, including the acid which can have on a clever profile, and other substances. As an example of a fluid and a powder flavor agent, a coconut, coffee, chocolate, A vanilla bean, a grapefruit, an orange, a lime, menthol, glycyrrhiza, Caramel aroma, honey aroma, a peanut, a walnut, a cashew nut, Hazel nuts, an almond, a pineapple, a strawberry, a raspberry, a tropical fruit, a cherry, a cinnamon, peppermint, wintergreen oil, a spearmint, a eucalyptus and a mint, for example, an apple, a pear, a peach, a strawberry, an apricot, a raspberry, a cherry, a pineapple, and a Japanese plum -- the fruit essence extracted from essence etc. is mentioned. As oil refinement, the oil of peppermint, a spearmint, menthol, a eucalyptus, a clove oil, bay oil, anise, thyme, cedar leaf oil, a nutmeg, and the above fruits is mentioned.

[0077]

A chewing gum flavor agent is a gestalt of the wafer of powder, slices, or those combination preferably, and may be a natural flavor agent freeze-dried. Grain size is calculated as the longest size of particles, and may be less than 1 mm still more preferably less than 2 mm less than 3 mm, for example. A natural flavor agent may be a gestalt whose grain size is about 3 micrometers 2 mm, for example, 4 micrometers, thru/or 1 mm. As a desirable natural flavor agent, the seed from the strawberry, blackberry, and raspberry from fruits is mentioned.

[0078]

Various resultant wind taste agents, for example, a mixed fruits flavor agent, may be used for the center of the chewing gum of this invention. As mentioned above, an aromatic may be used in a quantity smaller than what is used conventionally. An aromatic and/or a flavor agent may be used by the strength of a request of the aroma used and/or a flavor agent in 0.01 thru/or about 30% of the weight of the quantity of a final product. Preferably, the content of aroma / flavor agent is 0.2 thru/or 3% of the weight of the range of the total constituent.

[0079]

According to one embodiment, a chewing gum composition is pharmacological or contains a biological activity substance. Such an active substance (that comprehensive list is WO00/25598 (this description content), for example) As an example found out by being used into this specification by reference, the substance for the care of the mouths, such as drugs, a supplement, an antiseptic, a pH adjuster, an anti-smoking agent, hydrogen peroxide, and a compound that may emit urea during digestion, and a gear tooth, or a therapy is mentioned. As an example of the active substance of the gestalt of the active substance which adjusts pH in the mouth, :acid in which the following are mentioned, for example, adipic acid, succinic acid, fumaric acid, or those salts, Or the salt of citrate, tartaric acid, malic acid,

acetic acid, lactic acid, phosphoric acid, and glutaric acid, And the oxide of a permissible base, for example, carbonate, a hydrogencarbonate, an phosphate, sulfate or sodium, potassium, ammonium, magnesium or calcium especially magnesium, and calcium.
[0080]
The center of the gum of the chewing gum which this invention coated may have the arbitrary gestalten which coat a chewing gum center using the arbitrary conventional coating methods, shape, or a size. Therefore, the center of gum may be a gestalt chosen from a pellet, a pulvinate pellet, a stick, a tablet, a chunk, the pastille, a pill, a ball, and a ball, for example.
[0081]
This invention is indicated still in detail by the following un-restrictive examples and drawings.
[Example 1]
[0082]
Evaluation of the isobutylene isoprene rubber applied by this invention in a chewing gum base
The elastomer parts of the chewing gum base in a standard gum base often consist of two polyisobutylene (PIB) fractionation from which a molecular weight differs including about 3 of the total substance thru/or 30% typically. Steric exclusion chromatography (SEC) analyzed the sample of PIB applied by this invention as an elastomer in a gum base (refer to Table 1). The low-molecular-weight constituent of PIB consisted of a substance which has the polydispersed degree (PDI) which has the weight average molecular weight Mw of about 60,000g/mol, and changes in 1.5 thru/or 2.2.
[0083]
[Table 1]

表１：現在適用されるＰＩＢエラストマーのＳＥＣ分子量データ

試料	Ｍｎ	Ｍｗ	ＰＤＩ（Ｍｗ／Ｍｎ）
ＰＩＢ　１	２７，０００	５８，４００	２．１６
ＰＩＢ　２	３９，８００	５９，２００	１．４９

[Example 2]
[0084]
Preparation of a polyisobutylene substitute
Poly (epsilon-caprolactone -**- delta-valerolactone) (it is called poly (CAP-Cau VAL)) was prepared by the amount of supply of the 60 mol %epsilon-caprolactone and the 40%delta-valerolactone (60CAP:40VAL). Poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) (it is called poly (CAP-Cau VAL-TMC)) was prepared by the amount of supply of a 50 mol %epsilon-caprolactone, a 40 mol %delta-valerolactone, and 10 mol % trimethylene carbonate.
[0085]
The sample shown in the following table 2 was prepared for the evaluation as a polyisobutylene (PIB) substitute.
[0086]
[Table 2]

試料	組成物	Tg(℃)	Tm(℃)	Mn (g／モル)	PD I
2169−37 PIB sub. 1	ポリ(CAP−コ−VAL)	−65	15	60, 390	1. 47
52−1 PIB sub. 2	ポリ(CAP−コ−VAL −TMC)	−65	10	51, 190	1. 63
A PIB sub. 3	ポリ(CAP−コ−VAL −TMC)	−60	16	50, 780	1. 44
B PIB sub. 4	ポリ(CAP−コ−VAL −TMC)	−60	16	53, 340	1. 56

[0087]
Although the sample 2169-37 (PIBsub.1) was refined further and Mn was measured in a mol and 54,850g /after that, this shows that a sample is beginning to decompose.
[0088]
A characteristic decision of the synthetic sample was made as follows. :
Characteristic determination
By ^{13}C- of a routine, and a ^{1}H-NMR spectroscopic analysis, structural characteristic determination of the above-mentioned polymer was carried out. Deuterated chloroform as a 5-mm O.D. pipe and a solvent was used with the internal standard tetramethylsilane (TMS), and the spectrum was acquired with BrukerAC-300 (300 MHz) spectrometer. Sample concentration was about 5% (w/v) about about 20% (w/v) and a ^{1}H-NMR spectrum about the ^{13}C-NMR spectrum.
[0089]
Poly (CAP-Cau VAL) ^{13}C-NMR showed that the amount of supply (60 mol %CAP and 40 mol %VAL) and a synthetic copolymer constituent are almost equal.
[0090]
^{13}C-NMR of terpolymer poly (CAP-Cau VAL-TMC) specified being random structure and that the amount of supply of a synthetic terpolymer constituent and a monomer is almost equal.
[0091]
The steric-exclusion-chromatography (SEC) experiment was conducted and the molecular weight and polydispersed degree (PDI) of the polymeric material were become final and conclusive. A SEC system Waters Alliance2690 separation module, On-line multiple laser-light-scattering (MALLS) detector () [MiniDAWN and (trademark)] Wyatt Technology Inc., an interference measurement refractometer () [Optilab DSP (trademark) and] Wyatt Technology Inc. and one PLge(trademark) (Polymer Laboratories Inc.) SEC column of 2 sets of inside are equipped. Each of a group consists of two 3 micrometers or two 5-micrometer PLge (trademark) columns. A result is shown in Table 2.
[0092]
The heat characteristic of the obtained biodegradable material was characteristic-ized using the differential scanning calorimetry (DSC). Glass transition temperature (Tg) and a melting temperature (Tm) were measured using MettlerDSC30 or Perkin ElmerDSC-7. The sample was heated and quenched from -100 ** to 100 ** with 10 ** the heating rate for /, and it heated from -100 ** to 100 ** at the same speed again. A result is shown in Table 2.
[0093]
Rheology measurement was applied in order to choose the sample for which it was [for the up scale purpose] most suitable.
[0094]

Drawing 1 shows G* and tan (delta) opposite pitch. These parameters are indispensable about the textures characteristic of the last chewing gum. G* shows the close nature / hardness of chewing gum, and tan (delta) specifies the ratio between a loss modulus and a storage modulus. Rheology evaluation was performed using the flow meter AR1000 type (product made from TA Instrument). Vibration measurement is carried out at the temperature of 70 ** with the stress in a line viscoelasticity field using a parallel plate system (d= 2.0 cm, hatching).

[0095]

PIBsub.1 and PIBsub.2 -- best -- it selected so that properly, and it scaled up for the further inspection in a gum base and chewing gum.

[0096]

The characteristic of scale-up sample PIBsub.1 and PIBsub.2 is shown in the following table 3.

[0097]

[Table 3]

試料	組成物	Tg(℃)	Tm(℃)	Mn (g／モル)	PDI
52−19 PIB sub. 1	ポリ(CAP−コ−VAL)	−65	17	63, 957	1. 42
52−16T PIB sub. 2	ポリ(CAP−コ−VAL−TMC)	−65	8	72, 409	1. 67

[Example 3]

[0098]

Preparation of the polyisobutylene substitute by mixing of biodegradable polymer on the basis of epsilon-caprolactone, delta-valerolactone, and/or trimethylene carbonate

This example, The possibility of manufacture of the biodegradable polymer substitute which replaces the polyisobutylene (PIB) by mixing of the poly (epsilon-caprolactone -**- delta-valerolactone) and poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) of a different molecular weight is proved.

[0099]

Drawing 4, The molecular weight (Mn) of 18180g/mol in a 50/50% mixture. The poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) which has poly (epsilon-caprolactone -**- delta-valerolactone) and the molecular weight (Mn) of 76950g/mol which it has shows how rheology **** with standard PIB is produced.

[0100]

Rheology evaluation was performed using the flow meter AR1000 type (product made from TA Instrument). Vibration measurement is carried out at the temperature of 70 ** with the pitch of 1 Hz using a parallel plate system (d= 2.0 cm, hatching).

[Example 4]

[0101]

Substitution of the polyisobutylene in a gum base with synthetic poly (epsilon-caprolactone -**- delta-valerolactone) and poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate)

In order to examine synthetic poly (epsilon-caprolactone -**- delta-valerolactone) and poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) in the chewing gum base as a substitute to polyisobutylene (PIB), The following experiments were conducted.

[0102]

Namely, synthetic poly (epsilon-caprolactone -**- delta-valerolactone) (PIBsub.1) and Mn which have a Mn:63,957g/mol, Tg=-65 **, and Tm=17 ** : 72,409g/mol. Tg=-65 ** and Tm = the poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) (PIBsub.2) which has 8 ** was

examined with various gum base compounds.
[0103]
Various gum base compounds were prepared according to Table 4. Weight % shows the quantity in a constituent. In order to dissolve a softening system, the samples 118 and 119 were prepared except for the telophase of the mixing process which applied heat, without heating in a mixing process.
[0104]
[Table 4]

	標準 (115)	PIBsub. 1 (116)	PIBsub. 2 (117)	PIBsub. 2 (118)*	PIBsub. 2 (119)*
ブチル	5%	5%	5%	5%	5%
エラストマー 可塑剤	40%	40%	40%	40%	40%
充填剤	16. 5%	16. 5%	16. 5%	16. 5%	16. 5%
PIBsub. 1	—	14%	—	14%	—
PIBsub. 2	—	—	14%	—	14%
PIB 低Mw	14%	—	—	—	—
軟化系	24. 5%	24. 5%	24. 5%	24. 5%	24. 5%
チューインガム番号	141	142	143	144	145

PIBsub.1: Poly (epsilon-caprolactone -**- delta-valerolactone), a Mn:63,957g/mol, Tg=-65 **, and Tm=17 **.
PIBsub.2: Poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate), a Mn:72,409g/mol, Tg=-65 ** and Tm=8 **, a * low-temperature mix.
[0105]
Rheology measurement estimated the above-mentioned gum base. G' and tan (delta) opposite vibratory torque (muN.m) produce a line viscoelasticity field, and, thereby, show the stability of gum base structure. The result of these measurement is shown in drawing 2 and drawing 3. As shown in a figure, all gum bases are dramatically similar to two conventional gum bases included in the standard gum base 115 and a test facility. A deviation is in the field which may be indicated to have the quality which can permit a gum base.
[0106]
Rheology evaluation was performed using the flow meter AR1000 type (product made from TA Instrument). Vibration measurement is carried out at the temperature of 70 ** with the stress in a line viscoelasticity field using a parallel plate system (d= 2.0 cm, hatching).
[Example 5]
[0107]
PIB substitution in a standard chewing gum compound
The following experiments were performed in order that polyisobutylene (PIB) might examine the gum base replaced by PIBsub.1 and PIBsub.2 in a standard peppermint chewing gum compound. The standard peppermint chewing gum compound was prepared according to following Table 5.
[0108]
[Table 5]

	%
ガムベース	38
ソルビトール粉末	46
マルチトールシロップ	4
キシリトール粉末	6
ペパーミント油	2．0
カルバミド	3．5
ペパーミント粉末	0．20
アスパルテーム	0．20
アセスルファム	0．10

[0109]
Hardness was measured about the chewing gum sample shown in Table 6. The hardness of the test sample was investigated using the 3.5-mm test distance to the main part of chewing gum by the compression load examination using the Instron apparatus which has 4 mmDIA CYLINDER STAINLESS the speed for 25-mm/.
[0110]
[Table 6]

チューインガム番号	硬度（N）；平均5
141（14%PIB）	5．3
142（14%PIBsub．1）	5．1
143（14%PIBsub．2）	7．9
144（14%PIBsub．1）	5．9
145（14%PIBsub．2）	5．9

[0111]
As shown in Table 6, the sample containing either PIBsub.1 or PIBsub.2 is dramatically similar to the standard chewing gum (141) which contains PIB 14%. Hardness shows that a feeling of initial digestion is dramatically similar to a standard.
[Example 6]
[0112]
Consciousness evaluation
The test sample was distributed to the respondent who received ten persons' training, and the test sample was evaluated.
The following explanatory parameters became clear in comparison with standard chewing gum (141).
[0113]
A waxy feeling [KURIKKI /: / chewing gum number 142/ (cricky)] of initial digestion. However, in respect of others, standard 141 is resembled dramatically.
[0114]
Although a strong feeling of initial digestion of /stickiness harder than chewing gum number 143: corresponds very well with the determination of hardness, is adhesiveness and KURIKKI more, it resembles standard 141 dramatically in respect of others.
[0115]
It seems that the sample mixed at low temperature has good product quality about textures and

adhesiveness (samples 144 and 145).
[Brief Description of the Drawings]
[0116]
[Drawing 1]G^* and the tan(d) opposite pitch about a synthetic polyisobutylene substitute (PIBsub.1, PIBsub.2, PIBsub.3, and PIBsub.4) including two standards, PIB1 and PIB2, are shown.
[Drawing 2]G' pair vibratory torque (muN.m) about the gum base shown in Table 4 and two additional conventional gum bases is shown.
[Drawing 3]The tan(d) opposite vibratory torque (muN.m) about the gum base shown in Table 4 and two additional conventional gum bases is shown.
[Drawing 4]G' pair vibratory torque (muN.m) about synthetic polyisobutylene substitutes and those mixtures is shown.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]
It is an elastomer for chewing gums which consists of polyester polymer which can be obtained by the polymerization of a different cyclic ester monomer beyond two or it, An elastomer glass transition temperature (Tg) of this cyclic ester monomer is low, and ranges of whose glass transition temperature (Tg) of this polyester polymer are -20 ** thru/or -80 **.
[Claim 2]
The elastomer for chewing gums according to claim 1 chosen from a group which said cyclic ester monomer becomes from 4 member lactone, 5 member lactone, 6 member lactone, 7 member lactone, 8 member lactone, five-membered ring-like carbonate, and 6 membered-ring-like carbonate.
[Claim 3]
The elastomer for chewing gums according to claim 2 chosen from a group which said lactone becomes from beta propiolactone, gamma-butyrolactone, delta-valerolactone, epsilon-caprolactone, and 7-heptanolactone.
[Claim 4]
The elastomer for chewing gums according to claim 2 in which said cyclic carbonate is ethylene carbonate or trimethylene carbonate.
[Claim 5]
The elastomer for chewing gums according to claim 2 chosen from a group which said cyclic ester monomer becomes from epsilon-caprolactone, delta-valerolactone, and trimethylene carbonate.
[Claim 6]
The elastomer for chewing gums according to any one of claims 1 to 5 whose at least one cyclic ester monomer is epsilon-caprolactone.
[Claim 7]
The elastomer for chewing gums according to any one of claims 1 to 6 in which said polyester polymer contains at least 50-mol% of epsilon-caprolactone.
[Claim 8]
Have said polyester polymer and glass transition temperature (Tg) of the range of -25 ** thru/or -75 ** still more preferably, The elastomer for chewing gums according to any one of claims 1 to 7 in which said polyester polymer has the glass transition temperature (Tg) of the range of -45 ** thru/or -75 **.
[Claim 9]
An elastomer for chewing gums which consists of poly (epsilon-caprolactone -**- delta-valerolactone).
[Claim 10]
The elastomer for chewing gums according to claim 9 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is 1 thru/or 99-mol% of the range.
[Claim 11]
The elastomer for chewing gums according to claim 10 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is 40 thru/or 80-mol% of the range.

[Claim 12]
The elastomer for chewing gums according to claim 11 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is 50 thru/or 70-mol% of the range.
[Claim 13]
The elastomer for chewing gums according to claim 12 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is about 60-mol %.
[Claim 14]
The elastomer for chewing gums according to claim 9 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is 1 thru/or 99-mol% of the range.
[Claim 15]
The elastomer for chewing gums according to claim 14 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is 20 thru/or 60-mol% of the range.
[Claim 16]
The elastomer for chewing gums according to claim 15 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is 30 thru/or 50-mol% of the range.
[Claim 17]
The elastomer for chewing gums according to claim 16 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is about 40-mol %.
[Claim 18]
The elastomer for chewing gums according to claim 9 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone) molecular weight (Mn) is 10,000 thru/or 125,000g/mol.
[Claim 19]
The elastomer for chewing gums according to claim 18 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone) molecular weight (Mn) is 20,000 thru/or 100,000g/mol.
[Claim 20]
The elastomer for chewing gums according to claim 19 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone) molecular weight (Mn) is 30,000 thru/or 90,000g/mol.
[Claim 21]
The elastomer for chewing gums according to claim 20 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone) molecular weight (Mn) is 40,000 thru/or 80,000g/mol.
[Claim 22]
The elastomer for chewing gums according to claim 9 in which said poly (epsilon-caprolactone -**- delta-valerolactone) glass transition temperature Tg is less than 0 **.
[Claim 23]
The elastomer for chewing gums according to claim 22 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone) glass transition temperature Tg is -40 ** thru/or -80 **.
[Claim 24]
The elastomer for chewing gums according to claim 23 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone) glass transition temperature Tg is -50 ** thru/or -70 **.
[Claim 25]
An elastomer for chewing gums which consists of poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate).
[Claim 26]
The elastomer for chewing gums according to claim 25 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 1 thru/or 99-mol% of the range.
[Claim 27]
The elastomer for chewing gums according to claim 26 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 20 thru/or 80-mol% of the range.
[Claim 28]

The elastomer for chewing gums according to claim 27 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 40 thru/or 60-mol% of the range.
[Claim 29]
The elastomer for chewing gums according to claim 28 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is about 50-mol %.
[Claim 30]
The elastomer for chewing gums according to claim 25 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 1 thru/or 99-mol% of the range.
[Claim 31]
The elastomer for chewing gums according to claim 30 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 20 thru/or 60-mol% of the range.
[Claim 32]
The elastomer for chewing gums according to claim 31 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 30 thru/or 50-mol% of the range.
[Claim 33]
The elastomer for chewing gums according to claim 32 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is about 40-mol %.
[Claim 34]
The elastomer for chewing gums according to claim 25 whose mol percentage of trimethylene carbonate in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 1 thru/or 50-mol% of the range.
[Claim 35]
The elastomer for chewing gums according to claim 34 whose mol percentage of trimethylene carbonate in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 2 thru/or 30-mol% of the range.
[Claim 36]
The elastomer for chewing gums according to claim 25 whose mol percentage of trimethylene carbonate in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 5 thru/or 15-mol% of the range.
[Claim 37]
The elastomer for chewing gums according to claim 25 whose mol percentage of trimethylene carbonate in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is about 10-mol %.
[Claim 38]
The elastomer for chewing gums according to claim 25 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) molecular weight (Mn) is 10,000 thru/or 150,000g/mol.
[Claim 39]
The elastomer for chewing gums according to claim 38 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) molecular weight (Mn) is 20,000 thru/or 100,000g/mol.
[Claim 40]
The elastomer for chewing gums according to claim 39 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) molecular weight (Mn) is 30,000 thru/or 90,000g/mol.

[Claim 41]
The elastomer for chewing gums according to claim 40 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) molecular weight (Mn) is 40,000 thru/or 80,000g/mol.
[Claim 42]
The elastomer for chewing gums according to claim 25 in which said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) glass transition temperature Tg is less than 0 **.
[Claim 43]
The elastomer for chewing gums according to claim 42 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) glass transition temperature Tg is -40 ** thru/or -80 **.
[Claim 44]
The elastomer for chewing gums according to claim 43 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) glass transition temperature Tg is -50 ** thru/or -75 **.
[Claim 45]
claim 9 -- or. An elastomer for chewing gums which becomes any 1 paragraph of 24 from poly (epsilon-caprolactone -**- delta-valerolactone) of a statement, and the poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) mixture according to any one of claims 25 to 44.
[Claim 46]
A gum base where it is a gum base which consists of an elastomer and resin, and this elastomer consists of biodegradable polymer.
[Claim 47]
The gum base according to claim 46 where said resin consists of non-biodegradable resin.
[Claim 48]
The gum base according to claim 46 or 47 where said gum base consists of softeners.
[Claim 49]
A gum base where it is a gum base which consists of an elastomer and resin, and this elastomer consists of the biodegradable polymer according to any one of claims 1 to 45.
[Claim 50]
The gum base according to claim 49 where said resin consists of non-biodegradable resin.
[Claim 51]
The gum base according to claim 49 or 50 where said gum base consists of softeners.
[Claim 52]
Chewing gum in which it is the chewing gum which consists of an elastomer and resin, and this elastomer consists of biodegradable polymer.
[Claim 53]
The chewing gum according to claim 52 in which said resin consists of non-biodegradable resin.
[Claim 54]
The chewing gum according to claim 52 or 53 in which said gum base consists of softeners.
[Claim 55]
Chewing gum in which it is the chewing gum which consists of an elastomer and resin, and this elastomer consists of the biodegradable polymer according to any one of claims 1 to 45.
[Claim 56]
The chewing gum according to claim 55 in which said resin consists of non-biodegradable resin.
[Claim 57]
The chewing gum according to claim 55 or 56 in which said gum base consists of softeners.
[Claim 58]
A manufacturing method of chewing gum replaced by at least one biodegradable elastomer which has the rheology characteristic that at least one elastomer is equal to at least one conventional non-biodegradable elastomer suitable for chewing gum substantially.

[Claim 59]
A way according to claim 58 said at least one biodegradable elastomer consists of the biodegradable polymer according to any one of claims 1 to 45.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]
[0011]
Although it can replace all over a chewing gum base by resolvability polymer containing the polyester polymer which can obtain an elastomer compound, for example, polyisobutylene etc., by the polymerization of a different cyclic ester monomer beyond two or it, In this case, it was clarified by this invention persons here that the glass transition temperature (Tg) of a cyclic ester monomer is low, and the ranges of the glass transition temperature (Tg) of polyester polymer are -20 ** thru/or -80 **. In this way, the chewing gum base which uses such resolvability polymer for a surprising thing, and is prepared, For example, having the rheology characteristic (for example, plasticity (storage modulus) and elasticity (loss modulus)) the same as that of the conventional gum base prepared using polyisobutylene (PIB) or similar was found out.
[0012]
Typically, an elastomer compound improves dramatically the general resolvability of a gum base (i.e., the chewing gum itself) by constituting 20 thru/or 60% of all the gum base constituents, and replacing this constituent with the gum base which has a resolvability constituent.

[Translation done.]

* NOTICES *

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CORRECTION OR AMENDMENT

[Kind of official gazette]Printing of amendment by the regulation of 2 of Article 17 of Patent Law
[Section classification] The 1st classification of the part I gate
[Publication date]December 22 (2005.12.22), Heisei 17

[Official announcement number] ** table 2004-518447 (P2004-518447A)
[Announcement date] June 24, Heisei 16 (2004.6.24)
[Annual volume number] Public presentation / registration gazette 2004-024
[Application number]Application for patent 2002-574756 (P2002-574756)
[The 7th edition of International Patent Classification]

A23G 3/30
[FI]

A23G 3/30
[Written amendment]
[Filing date]February 17, Heisei 17 (2005.2.17)
[Amendment 1]
[Document to be Amended]Claim
[Item(s) to be Amended]Whole sentence
[Method of Amendment]Change
[The contents of amendment]
[Claim(s)]
[Claim 1]
It is an elastomer for chewing gums which consists of polyester polymer which can be obtained by the polymerization of a different cyclic ester monomer beyond two or it, An elastomer glass transition temperature (Tg) of this cyclic ester monomer is low, and ranges of whose glass transition temperature (Tg) of this polyester polymer are -20 ** thru/or -80 **.
[Claim 2]
The elastomer for chewing gums according to claim 1 chosen from a group which said cyclic ester monomer becomes from 4 member lactone, 5 member lactone, 6 member lactone, 7 member lactone, 8 member lactone, five-membered ring-like carbonate, and 6 membered-ring-like carbonate.
[Claim 3]
The elastomer for chewing gums according to claim 2 chosen from a group which said lactone becomes from beta propiolactone, gamma-butyrolactone, delta-valerolactone, epsilon-caprolactone, and 7-heptanolactone.
[Claim 4]
The elastomer for chewing gums according to claim 2 in which said cyclic carbonate is ethylene carbonate or trimethylene carbonate.

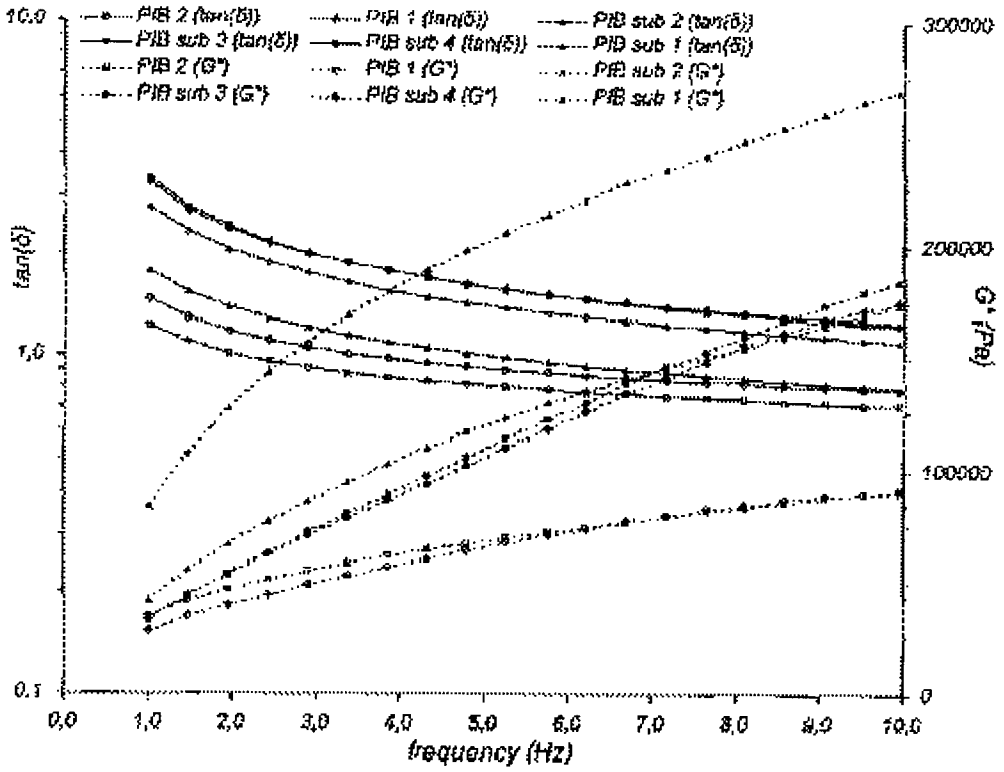
[Claim 5]
The elastomer for chewing gums according to claim 2 chosen from a group which said cyclic ester monomer becomes from epsilon-caprolactone, delta-valerolactone, and trimethylene carbonate.
[Claim 6]
The elastomer for chewing gums according to any one of claims 1 to 5 whose at least one cyclic ester monomer is epsilon-caprolactone.
[Claim 7]
The elastomer for chewing gums according to any one of claims 1 to 6 in which said polyester polymer contains at least 50-mol% of epsilon-caprolactone.
[Claim 8]
Have said polyester polymer and glass transition temperature (Tg) of the range of -25 ** thru/or -75 ** still more preferably, The elastomer for chewing gums according to any one of claims 1 to 7 in which said polyester polymer has the glass transition temperature (Tg) of the range of -45 ** thru/or -75 **.
[Claim 9]
The elastomer for chewing gums according to claim 1 which consists of poly (epsilon-caprolactone -**- delta-valerolactone).
[Claim 10]
The elastomer for chewing gums according to claim 9 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is 1 thru/or 99-mol% of the range.
[Claim 11]
The elastomer for chewing gums according to claim 10 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is 40 thru/or 80-mol% of the range.
[Claim 12]
The elastomer for chewing gums according to claim 11 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is 50 thru/or 70-mol% of the range.
[Claim 13]
The elastomer for chewing gums according to claim 12 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is about 60-mol %.
[Claim 14]
The elastomer for chewing gums according to claim 9 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is 1 thru/or 99-mol% of the range.
[Claim 15]
The elastomer for chewing gums according to claim 14 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is 20 thru/or 60-mol% of the range.
[Claim 16]
The elastomer for chewing gums according to claim 15 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is 30 thru/or 50-mol% of the range.
[Claim 17]
The elastomer for chewing gums according to claim 16 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone) is about 40-mol %.
[Claim 18]
The elastomer for chewing gums according to claim 9 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone) molecular weight (Mn) is 10,000 thru/or 125,000g/mol.
[Claim 19]
The elastomer for chewing gums according to claim 18 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone) molecular weight (Mn) is 20,000 thru/or 100,000g/mol.
[Claim 20]
The elastomer for chewing gums according to claim 19 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone) molecular weight (Mn) is 30,000 thru/or 90,000g/mol.
[Claim 21]
The elastomer for chewing gums according to claim 20 which is a range in which said poly (epsilon-

caprolactone -**- delta-valerolactone) molecular weight (Mn) is 40,000 thru/or 80,000g/mol.
[Claim 22]
The elastomer for chewing gums according to claim 9 in which said poly (epsilon-caprolactone -**- delta-valerolactone) glass transition temperature Tg is less than 0 **.
[Claim 23]
The elastomer for chewing gums according to claim 22 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone) glass transition temperature Tg is -40 ** thru/or -80 **.
[Claim 24]
The elastomer for chewing gums according to claim 23 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone) glass transition temperature Tg is -50 ** thru/or -70 **.
[Claim 25]
The elastomer for chewing gums according to claim 1 which consists of poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate).
[Claim 26]
The elastomer for chewing gums according to claim 25 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 1 thru/or 99-mol% of the range.
[Claim 27]
The elastomer for chewing gums according to claim 26 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 20 thru/or 80-mol% of the range.
[Claim 28]
The elastomer for chewing gums according to claim 27 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 40 thru/or 60-mol% of the range.
[Claim 29]
The elastomer for chewing gums according to claim 28 whose mol percentage of epsilon-caprolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is about 50-mol %.
[Claim 30]
The elastomer for chewing gums according to claim 25 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 1 thru/or 99-mol% of the range.
[Claim 31]
The elastomer for chewing gums according to claim 30 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 20 thru/or 60-mol% of the range.
[Claim 32]
The elastomer for chewing gums according to claim 31 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 30 thru/or 50-mol% of the range.
[Claim 33]
The elastomer for chewing gums according to claim 32 whose mol percentage of delta-valerolactone in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is about 40-mol %.
[Claim 34]
The elastomer for chewing gums according to claim 25 whose mol percentage of trimethylene carbonate in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 1 thru/or 50-mol% of the range.
[Claim 35]
The elastomer for chewing gums according to claim 34 whose mol percentage of trimethylene carbonate

in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 2 thru/or 30-mol% of the range.
[Claim 36]
The elastomer for chewing gums according to claim 25 whose mol percentage of trimethylene carbonate in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is 5 thru/or 15-mol% of the range.
[Claim 37]
The elastomer for chewing gums according to claim 25 whose mol percentage of trimethylene carbonate in said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) is about 10-mol %.
[Claim 38]
The elastomer for chewing gums according to claim 25 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) molecular weight (Mn) is 10,000 thru/or 150,000g/mol.
[Claim 39]
The elastomer for chewing gums according to claim 38 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) molecular weight (Mn) is 20,000 thru/or 100,000g/mol.
[Claim 40]
The elastomer for chewing gums according to claim 39 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) molecular weight (Mn) is 30,000 thru/or 90,000g/mol.
[Claim 41]
The elastomer for chewing gums according to claim 40 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) molecular weight (Mn) is 40,000 thru/or 80,000g/mol.
[Claim 42]
The elastomer for chewing gums according to claim 25 in which said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) glass transition temperature Tg is less than 0 **.
[Claim 43]
The elastomer for chewing gums according to claim 42 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) glass transition temperature Tg is -40 ** thru/or -80 **.
[Claim 44]
The elastomer for chewing gums according to claim 43 which is a range in which said poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) glass transition temperature Tg is -50 ** thru/or -75 **.
[Claim 45]
claim 9 -- or. An elastomer for chewing gums which becomes any 1 paragraph of 24 from poly (epsilon-caprolactone -**- delta-valerolactone) of a statement, and the poly (epsilon-caprolactone -**- delta-valerolactone courtly methylene carbonate) mixture according to any one of claims 25 to 44.
[Claim 46]
A gum base where it is a gum base which consists of an elastomer and resin, and this elastomer consists of the biodegradable polymer according to any one of claims 1 to 45.
[Claim 47]
The gum base according to claim 46 where said resin consists of non-biodegradable resin.
[Claim 48]
The gum base according to claim 46 or 47 where said gum base consists of softeners.
[Claim 49]
Chewing gum in which it is the chewing gum which consists of an elastomer and resin, and this elastomer consists of the biodegradable polymer according to any one of claims 1 to 45.

[Claim 50]
The chewing gum according to claim 49 in which said resin consists of non-biodegradable resin.
[Claim 51]
The chewing gum according to claim 49 or 50 in which said gum base consists of softeners.

[Translation done.]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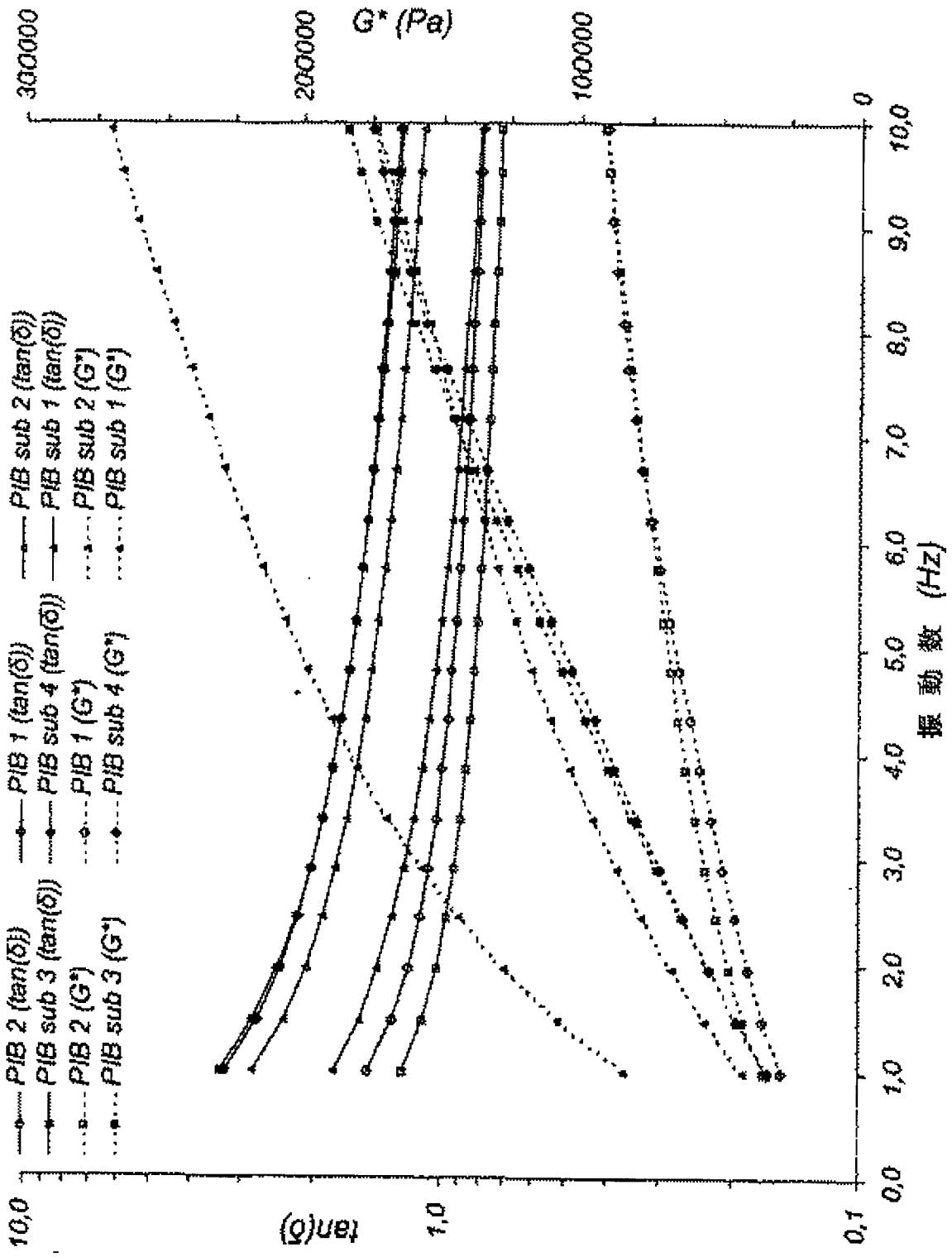
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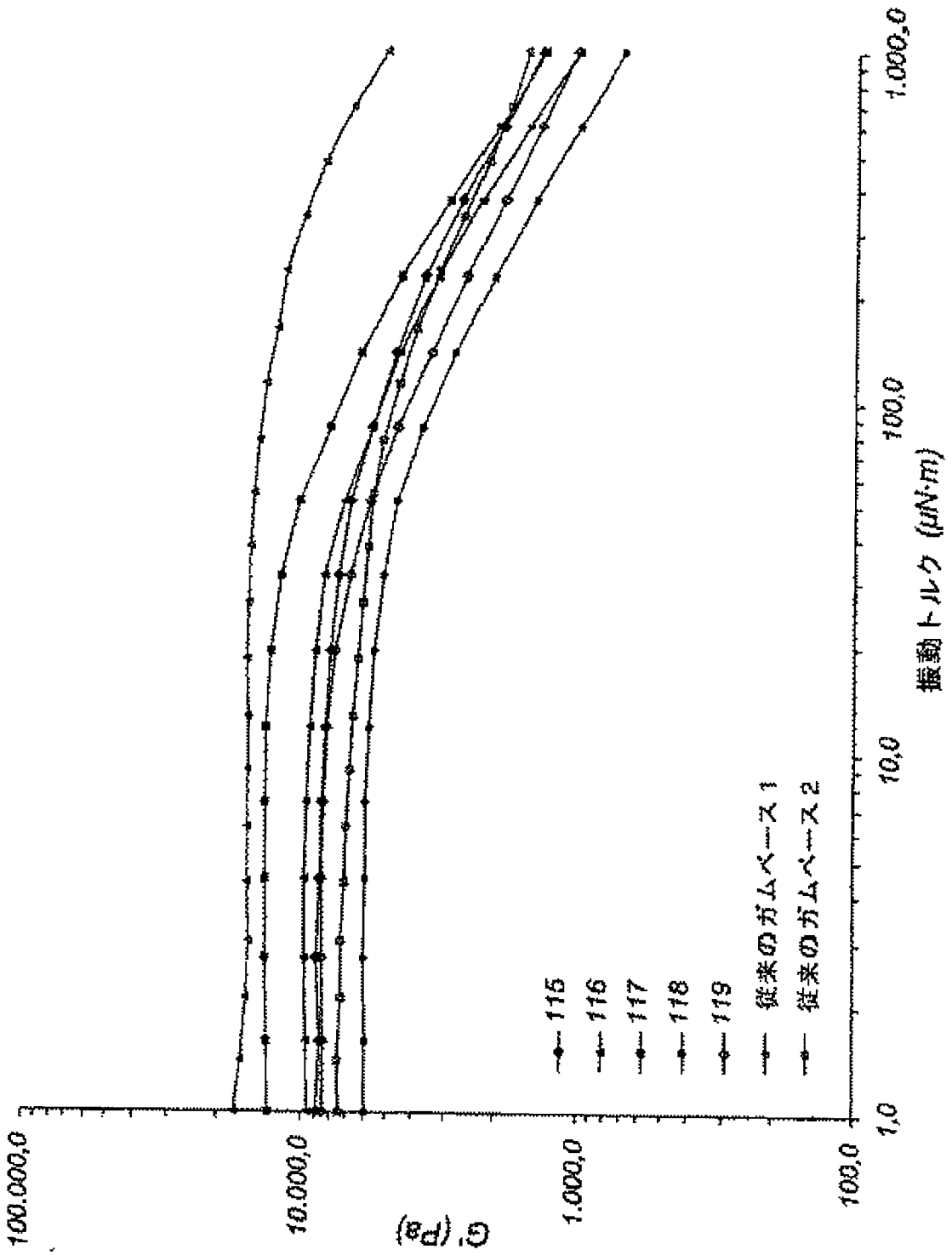
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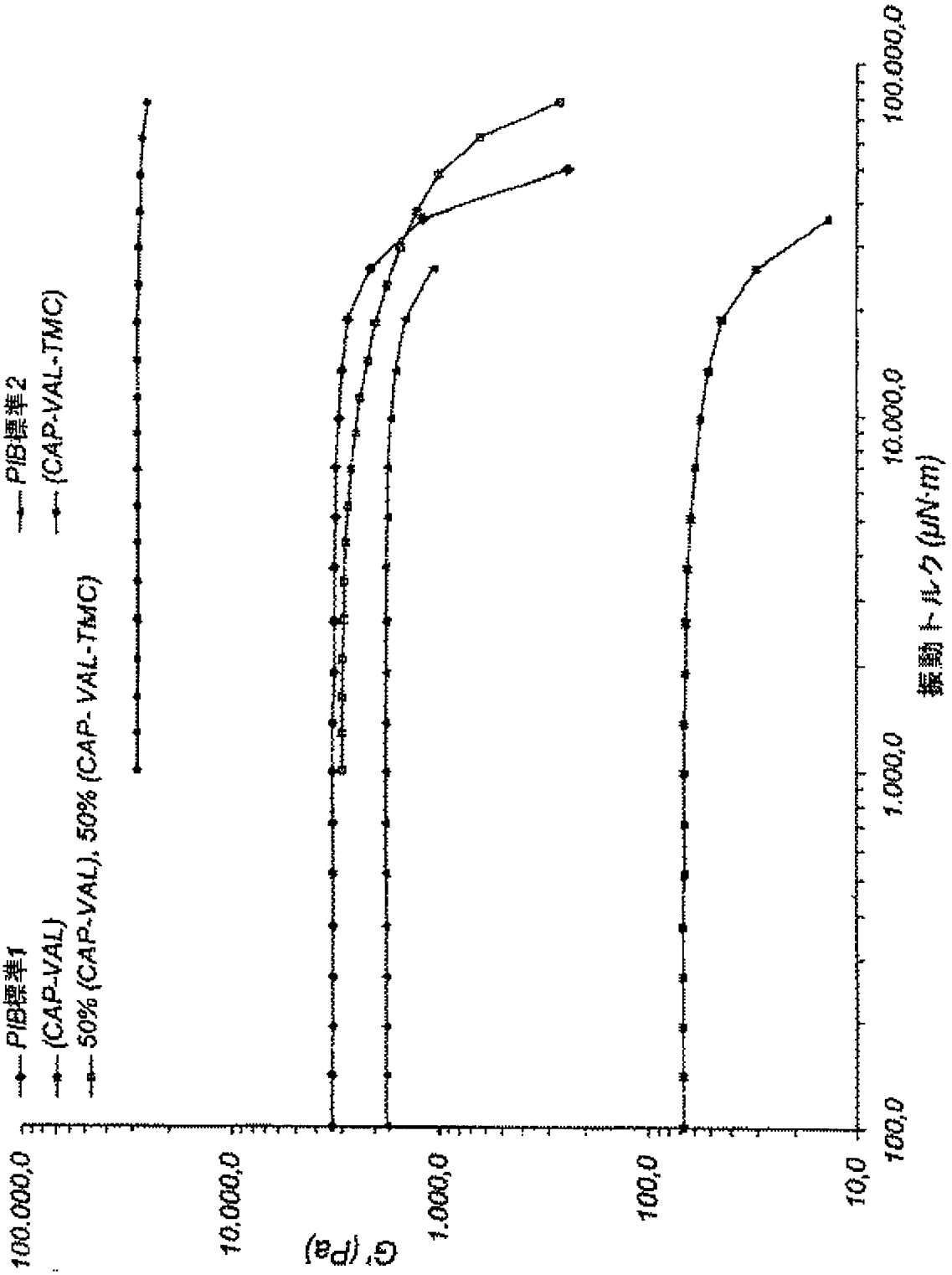
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